CLAIMS

1. A device for voice activity detection comprising a sound signal analyser arranged to determine whether a sound signal comprises speech, **characterised** by

a microphone system (2a, 2b, 2c, 2d, 2e) arranged to discriminate sounds emanating from sources located in different directions from the microphone system, so that sounds only emanating from a range of directions are included as signals possibly containing speech.

2. A device according to claim 1, **characterised** in that the range of directions is directed in the direction of an intended user's mouth (3).

3. A device according to claim 2, **characterised** in that the microphone system comprises two microphone elements (2a, 2b) separated a distance and located on a line directed in the direction of an intended user's mouth (3).

4. A device according to claim 3, **characterised** in that the range of directions is defined as all sounds falling inside a cone with a cone angle α, wherein $10° < \alpha < 30°$.

5. A device according to claim 3, **characterised** in that α is approximately 25°.

6. A device according to claim 2, **characterised** in that the microphone system comprises three microphone elements (2b, 2c, 2d) separated a distance and located in a plane directed in the direction of an intended user's mouth (3).

7. A device according to claim 6, **characterised** in that two (2c, 2d) of said three microphone elements are separated a distance and located on a line directed perpendicular to the direction of an intended user's mouth (3).

8. A device according to claim 2, **characterised** in that the microphone system comprises four microphone elements (2b, 2c, 2d, 2e), located such that the fourth microphone (2e) is not located in the same plane as the three others (2b, 2c, 2d).

9. A device according to any one of claims 1 to 8, **characterised** in that the microphone elements (2a, 2b, 2c, 2d, 2e) are directional with a pattern having maximal sensitivity in the direction of an intended user's mouth (3).

10. A device according to claim 1, **characterised** in that the microphone system comprises one directional microphone element together with one or more other microphone elements adapted to remove the uncertainty in the direction of the sound source.

11. A device according to claims 10, **characterised** in that the directional microphone element is adapted to measure the sound pressure level relative to the other microphone element.

12. A mobile apparatus, **characterised** in that it comprises a device as defined in any one of claims 1 to 11.

13. A mobile apparatus according to claim 12, **characterised** in that the microphone elements (2a, 2b, 2c, 2d) are located at the lower edge of the apparatus.

14. A mobile apparatus according to claim 12, **characterised** in that a plurality of microphone elements (2a, 2b, 2c, 2d) are located at the lower edge of the apparatus and at least one further microphone element (2e) is located at a distance from the lower edge.

15. A mobile apparatus according to any one of claims 12 to 14, **characterised** in that it is a mobile radio terminal, e.g. a mobile telephone (1), a pager, a communicator, an electric organiser or a smartphone.

16. An accessory for a mobile apparatus, **characterised** in that it comprises a microphone system (2a, 2b, 2c, 2d, 2e) as defined in any one of claims 1 to 11.

17. An accessory according to claim 16, **characterised** in that the direction of the range of directions is adjustable.

18. An accessory according to claim 16 or 17, **characterised** in that it is a hands-free kit.

19. An accessory according to claim 16 or 17, **characterised** in that it is a telephone conference microphone.

20. A method for voice activity detection, **characterised** by the steps of: receiving sound signals from a microphone system (2a, 2b, 2c, 2d, 2e) arranged

to discriminate sounds emanating from sources located in different directions from the microphone system;
determining the direction of the sound source causing the sound signals;
if the sounds emanate from a first range of directions, further analyse the sound to determine whether the sound signal comprises speech;
but if the sounds emanate from a second, different range of directions decide that the sound signal does not comprise speech.

21. A method according to claim 20, **characterised** in that the first range of directions is directed in the direction of an intended user's mouth (3).

22. A method according to claims 21, **characterised** in that the first range of directions is defined as all sounds falling inside a cone with a cone angle α, wherein $10° < \alpha < 30°$.

23. A method according to claims 22, **characterised** in that α is approximately 25°.

24. A method according to any one of claims 22 or 23, **characterised** in that the microphone system comprises at least two microphone elements (2a, 2b) located at a distance from each other and located on a line directed in the direction of an intended user's mouth (3), said two microphone elements being separated a distance d, wherein the direction to the sound source θ is calculated as

$$\theta = \arccos \frac{\Delta t \cdot v}{2 \cdot d}$$

where
Δt is the time difference between the sounds from the two microphone elements,
v is the velocity of sound.

25. A method according to claims 20, **characterised** in that one directional microphone element is used together with one or more other microphone elements to remove the uncertainty in the direction of the sound source.

26. A method according to claims 25, **characterised** in that the directional microphone element is used to measure the sound pressure level relative to the other microphone element.